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REPORT ON
TRAFFIC, REVENUES AND EXPENSES
FOR THE
PROPOSED COLUMBIA RIVER BRIDGE
AT
ASTORIA, OREGON AND POINT ELLICE, WASHINGTON

NOVEMBER 28, 1958

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COVERDALE & COLPITTS
CONSULTING ENGINEERS
120 WALL STREET
NEW YORK 5, N. Y.

REPORT ON
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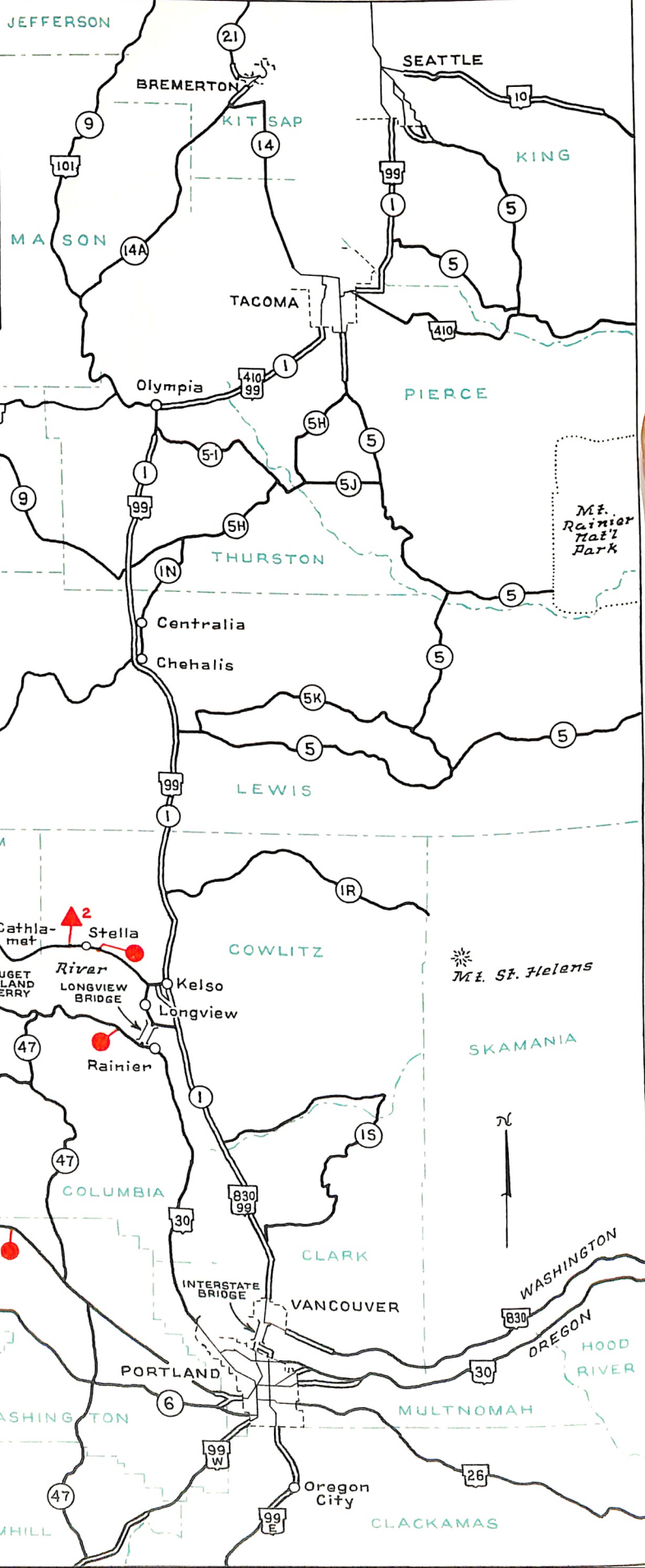
2 - Astoria-Megler - Traffic Survey, Instructions to Interviewers,
Sample Interview Cards

This is a detailed map of Washington state, showing major highways, cities, and geographical features. The map includes labels for counties such as Jefferson, Mason, King, Pierce, Thurston, Lewis, Cowlitz, Skamania, Clark, Multnomah, and Clackamas. Major cities like Seattle, Tacoma, Olympia, Centralia, Chehalis, Kelso, Longview, Rainier, Vancouver, Portland, and Oregon City are marked. The map also shows the Columbia River, Willamette River, and Hood River. A north arrow is present in the lower right corner.

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November 28, 1958

Washington Toll Bridge Authority
Transportation Building
Olympia, Washington

Washington State Highway Commission
Transportation Building
Olympia, Washington

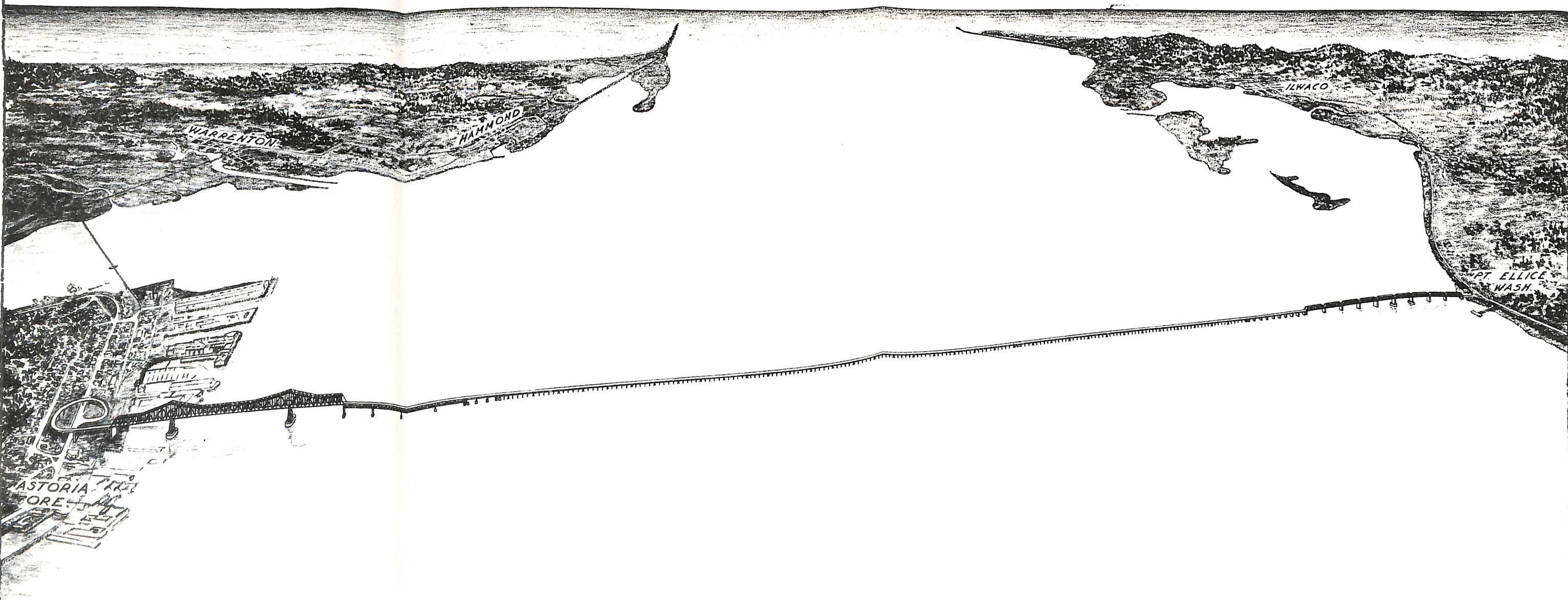
Oregon State Highway Department
Salem, Oregon

Dear Sirs:

In accordance with your request, we have made a study of motor vehicle traffic which is potential for the proposed Bridge to be erected across the Columbia River between Astoria, Oregon and Point Ellice, Washington. The map facing this page shows the location of the Bridge, the traffic survey stations and certain permanent traffic recorders which supplied pertinent data. Our study included a field survey of motor vehicle traffic and extensive driving in the area to record times and distances for trips which may use the proposed Bridge.

Using the findings of this study we developed estimates of traffic, toll revenue, expense and net revenue available for debt service which may be reasonably expected for the proposed Bridge if operated as a toll facility.

In 1954 we participated in a study of a proposal for a new bridge at this same general location, submitting our report in March, 1955. The current study on which we report herein has a somewhat different scope than our 1954 study, but the estimates reported herein are to be considered up-to-date revisions of the earlier estimates.



H. L. Spooner
1872

• • PROPOSED • COLUMBIA • RIVER • BRIDGE • AT • ASTORIA, • OREGON • •

BRIDGE DESIGN

The subject Bridge is being designed by the Oregon State Highway Department to be 4.1 miles long; to have two lanes for traffic, one in each direction; to have a high-level fixed span across the south channel of the Columbia River near Astoria; to have a medium-height fixed span across the north channel near the Washington shore; to have a spiral approach ramp connecting with Marine Drive in Astoria; and to connect at grade with US 101 at Point Ellice, Washington. The illustration opposite shows these principal features of the proposed Bridge. The Bridge will carry highway US 101 across the Columbia River.

We have been advised that this proposed Bridge is expected to cost \$25,000,000. If this cost is financed by conventional revenue bond methods, \$3,000,000 additional would be required for interest during construction, reserves and financing costs. If this bond issue were sold today it might require a 5 per cent interest rate which would result in annual interest charges of \$1,400,000.

The Oregon State Highway Department has advised us that 1964 may be expected to be the Bridge's first full year of operation.

FERRY OPERATION

The Columbia River crossings are now made by the Astoria-Megler Ferry System operated by the Oregon State Highway Department, using three motor vessels, The M. R. Chessman, Tourist 2 and Tourist 3. The Department has advised us that Tourist 2 and Tourist 3 are older wooden vessels which will need to be replaced within a few years at a cost in the millions of dollars. The schedules operated by this Ferry are summarized on the following page and are given in detail in Exhibit 1 of this Report. At all times of the year the first morning departures are at 6:30 A.M. from Astoria and 7:15 A.M. from Megler. The last scheduled departures for the seven winter months are from Astoria at 8:00 P.M. and from Megler

at 8:45 P.M. In the summer months the last departures are at 9:30 P.M. from Astoria and 10:15 P.M. from Megler. Service is never available during the mid-night hours. Sixty per cent of the Ferry trips, during the period of mid-September until early June, are operated on a schedule which has 1-1/2-hour intervals between departures. During July and August the boats are operated at 1/2-hour intervals at most times.

SUMMARY OF FERRY SCHEDULES

Months	No. of Trips Per Day	Total No. of Trips During Period	Per Cent of Total Annual Trips During Period	From Astoria		From Megler		Normal Interval Between Trips (Min.)
				First Trip of the Day (AM)	Last Trip of the Day (PM)	First Trip of the Day (AM)	Last Trip of the Day (PM)	
Jan. - Apr., Oct.-Dec. (7 mos.)	10	2,120	46.3%	6:30	8:00	7:15	8:45	90
May, first part of June, last part of Sept. (2 mos.)	11	671	14.7	6:30	9:30	7:15	10:15	90
Last part of June, first part of Sept. (1 mo.)	16	480	10.5	6:30	9:30	7:15	10:15	60
July and August (2 mos.)	21	1,302	28.5	6:30	9:30	7:15	10:15	30
Annual Totals, or Averages	12.5	4,573	100.0%					81.7

The actual Ferry trip requires about 30 minutes. This crossing time, plus a normal 15-minute requirement for loading and unloading results in about

PROPOSED COLUMBIA RIVER BRIDGE AT ASTORIA

SUMMARY DATA ON THE OPERATION OF FIELD TRAFFIC SURVEY STATIONS

Survey Station No.	Highway	Location	Period of Operation	Traffic Count During Survey Period	No. of Interviews	Per Cent Interviewed	Estimated Traffic - 1958	
							Annual Average Daily Traffic	Total Annual Traffic
1	Astoria-Megler Ferry US 101	Between Astoria, Oregon and Megler, Washington	9 AM-12 Noon, Saturday, July 26, 1958	174	174	100.0%		
			6 AM-10 PM, Sunday, July 27, 1958	832	832	100.0		
			6 AM-10 PM, Monday, July 28, 1958	691	691	100.0		
			Station Total	1,697	1,697	100.0%	342	125,000
2	US 830	West of Stella, Washington	3 PM- 6 PM, Saturday, July 26, 1958	381	365	95.8%		
			6 AM- 9 PM, Sunday, July 27, 1958	2,887	2,731	94.6		
			6 AM- 9 PM, Monday, July 28, 1958	1,707	1,650	96.7		
			Station Total	4,975	4,746	95.4%	1,603	585,000
3	US 26	East of Junction with US 101, Clatsop County, Oregon	9 AM- 6 PM, Tuesday, July 29, 1958	1,676	1,615	96.4%	1,986	725,000
			GRAND TOTAL	8,348	8,058	96.5%	3,931	1,435,000

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Consulting Engineers
120 Wall St., New York

45 minutes being required for the entire trip providing that the motorist's arrival at the Ferry coincides with a scheduled departure. The proposed Bridge will permit a crossing time of about 8 minutes. This reduction in crossing time and the increase in convenience from the availability of a Bridge would be a material improvement in the way of life for those persons who now depend on this Ferry for transportation. The Ferry costs the Oregon State Highway Department a net expense of about \$90,000 each year.

FIELD TRAFFIC SURVEY

In order to obtain data with which to estimate the potential traffic for the proposed Bridge, we operated three field traffic survey stations in the area. The locations, schedules of operation, traffic volumes and number of motorist interviews obtained at each of these stations is shown on the table opposite. The locations of these stations are also shown on the map facing page 1.

At each of these traffic survey stations, we asked all motorists the following questions:

"Where did you start this trip, today?"

"Where will this trip end, today?"

We also asked these same questions of the few "foot passengers" that used the Ferry.

We also recorded the following for each interview:

1. The location, date and hour of the interview.
2. The direction in which the motorist was traveling.
3. For passenger cars, the State in which the vehicle was registered, as follows:
 - A. Washington
 - B. Oregon
 - C. Another State

4. For trucks or buses, the type of vehicle including the number of axles and wheels.
5. In some instances, the route which the driver had chosen for the trip.
6. In some instances, the frequency with which the driver makes the trip in terms of day per month.

This interview information was recorded directly on IBM "mark-sense" cards which were subsequently processed with IBM equipment to obtain summary tabulations of the data. Illustrations of the interview cards with data recorded thereon are shown in Exhibit 2.

This field traffic survey recorded data on interviews with more than 8,000 motorists. At the same time that the motorists were being interviewed, other field personnel were making a continuous manual classification count to provide an independent record of the number of each type of vehicle passing through the survey station. Portable recording traffic counting machines were operated continuously near the sites of the survey stations on US 830 and US 26 so that we obtained complete, hourly traffic volume data for a full week including the period of the interviewing. These machines were operated by the State Highway Departments.

At the Astoria-Megler Ferry we were able to use the Ferry's toll collection records for an independent count of traffic for a control on our interview data.

Daily and Monthly Ferry Traffic

The table on the following page lists the number of vehicles using the Astoria-Megler Ferry each day during the month of July 1958. A significant point illustrated by this table is that the Ferry records its highest volumes on Sunday, indicating that it is used to a large degree by week end, recreational traffic.

PROPOSED COLUMBIA RIVER BRIDGE AT ASTORIATRAFFIC OF ASTORIA-MEGLER FERRY BY DAYS, JULY 1958

Day	No. of Vehicles
Tuesday 1	534
Wednesday 2	633
Thursday 3	784
Friday 4	972
Saturday 5	980
Sunday 6	956
Monday 7	786
Tuesday 8	633
Wednesday 9	670
Thursday 10	687
Friday 11	703
Saturday 12	713
Sunday 13	878
Monday 14	682
Tuesday 15	647
Wednesday 16	754
Thursday 17	699
Friday 18	708
Saturday 19	760
Sunday 20	1,003
Monday 21	738
Tuesday 22	656
Wednesday 23	658
Thursday 24	661
Friday 25	706
Saturday 26	731
Sunday 27	972
Monday 28	803
Tuesday 29	762
Wednesday 30	724
Thursday 31	703
Total	23,296

Average Days	No. of Vehicles	% of Average Week
Sunday	952	17.9%
Monday	752	14.2
Tuesday	646	12.2
Wednesday	688	12.9
Thursday	707	13.3
Friday	772	14.5
Saturday	796	15.0
Average Week	5,313	100.0%
Average Day of Month	751	14.1%

The Ferry records also supplied monthly traffic volume data as listed below:

	No. of Vehicles	% of 12 Months	Average Daily Traffic
1957: April	7,060	5.6%	235
May	8,112	6.5	262
June	13,758	11.0	459
July	21,029	16.8	678
August	26,151	20.9	844
September	18,046	14.4	602
October	7,100	5.7	229
November	5,131	4.1	171
December	5,613	4.5	181
1958: January	3,288	2.6	106
February	4,696	3.7	168
March	5,234	4.2	169
Total	125,218	100.0%	343

The above-listed data show that 63.1 per cent of a year's Ferry traffic is carried during the four-month period of June through September. It is to be noted that January 1958 traffic was only 2.6 per cent of the year's total and that average daily traffic fluctuated between 106 for January 1958 and 844 for August 1957. This eight-fold variation in average daily traffic and the high summer traffic volumes are further evidence that the Ferry's traffic is largely recreational.

Ferry Traffic Origins and Destinations

The information recorded during the interviews with 1,697 motorists using the Ferry was classified, tabulated and analyzed for quantitative findings on origins and destinations of trips now being made on the Ferry. There were thirteen classes of trips that accounted for 75 per cent of the total volume using the Ferry. These thirteen principal movements and the percentage each is of the 75 per cent are listed on the following page. The map facing page 1 shows the location of these origins and destinations of vehicles using the Ferry.

PRINCIPAL TRIPS USING THE ASTORIA-MEGLER FERRY

Trips Between	Washington			
	Pacific County	Olympic Peninsula (Including Aberdeen and Bremerton)	South and East Sides of Puget Sound	Total
Oregon				
Clatsop County	25%	15%	20%	60%
Tillamook County	3	5	5	13
Coastal Counties, Lincoln and South	3	2	3	8
Portland	11	2	4	17
Interior (other than Portland)	2	-	-	2
Total	44%	24%	32%	100%

The percentages shown above indicate that Clatsop County, Oregon is the major origin and destination of motor vehicle trips using the Ferry, accounting for 60 per cent of the major movements. "Local" trips between Clatsop and Pacific Counties made up the largest traffic movement, 25 per cent of the total of the principal trips.

License Plates Using Ferry

As previously mentioned, we recorded the State of the license plate for each vehicle interviewed on the Ferry. These data are summarized for passenger cars (not trucks), as follows:

Washington license plates	658	40.2%
Oregon license plates	581	35.5
Other States	397	24.3
	1,636	100.0%

These license plate data, which were obtained at the height of the tourist season, appear to confirm previously mentioned findings: that the traffic using the Ferry is predominantly from the two adjacent States of Washington and Oregon.

TOLL SCHEDULES

The Ferry toll schedule, and the application of this toll schedule to the traffic which used the Ferry for the twelve-month period of April 1957 through March 1958 are shown below:

Classification	Toll	Traffic	Revenue
<u>Passenger cars and pickups</u>	\$1.25	114,456	\$143,070
<u>Passenger cars with:</u>			
Trailers up to 25 feet	1.50	265	397
Trailers up to 35 feet	2.00	2,832	5,664
Trailers over 35 feet	2.75	400	1,100
<u>Motorcycles</u>	.50	439	219
<u>Motorcycles with sidecars</u>	.75	10	7
<u>Trucks</u>			
Under 20 feet	1.75	2,351	4,114
20 feet to 30 feet	2.50	3,494	8,735
30 feet to 40 feet	3.00	474	1,422
40 feet to 50 feet	3.50	466	1,631
Over 50 feet	4.25	31	131
<u>Passengers</u>			
Children	.15	40,613	6,091
Adults	.25	191,605	47,901
Truck loads - tons	.25	10,564	2,641
Livestock - head	.50	205	102
Package freight - Cwt.	.50		697
Total revenue			\$223,926
Totals and Averages			
Passenger cars and passengers	\$1.72	114,456	\$197,063
Trucks and cargo	2.86	6,816	19,474
Others	1.87	3,946	7,388
All vehicles	\$1.79	125,218	\$223,926

PROPOSED COLUMBIA RIVER BRIDGE AT ASTORIA

TOLL SCHEDULES IN EFFECT AT VARIOUS CROSSINGS OF
THE COLUMBIA RIVER AND PUGET SOUND

	Astoria-Megler Ferry	Puget Island Ferry	Longview Bridge	Interstate Bridge*	The Dalles Bridge	Umatilla Bridge	Tacoma Narrows Bridge**	Fox Island Bridge**
Passenger car	\$1.25	\$1.00 RT 1.75	\$.50	\$.20	\$.50	RT \$1.00 1.25	\$.50	\$.50
Passenger, other than driver	Adult \$.25 Child .15	\$.15 RT .25					\$.10	\$.10
Passenger car with trailer	to 25' \$1.50 to 35' 2.00 to 50' 2.75		\$.75	\$.40		Utility \$1.25 Other 1 axle 1.50 Other 2 axle 1.75	Light \$.75 Other 1.05	Light \$1.00 Other 1.95
Truck	to 20' \$1.75 20' -30' 2.50 30' -40' 3.00 40' -50' 3.50 50' -55' 4.25	\$1.50 RT 2.50	2T- 3T \$.75 3T- 6T 1.00 6T- 9T 1.20 9T-12T 1.40 12T-15T 1.60 15T-18T 1.80 18T-21T 2.00 21T-24T 2.20 24T-27T 2.40 27T-30T 2.60 30T-33T 2.80 33T-36T 3.00	Single \$.40 Comb. .60	2-axle \$1.00 3-axle 1.50 4-axle 2.00 5-axle 2.50 6-axle 3.00	2-axle \$1.50 3-axle 2.00 4-axle 2.75 5-axle 3.50 6-axle 4.25	2T- 3T \$.65 3T- 6T 1.00 6T- 9T 1.50 9T-12T 2.00 12T-15T 2.50 15T-18T 3.00 18T-21T 3.60 21T-24T 4.20 24T-27T 4.90 27T-30T 5.60 30T-33T 6.30 33T-36T 7.00	3T- 6T \$.95 6T- 9T 1.45 9T-12T 1.95 12T-15T 2.40 15T-18T 2.85 18T-21T 3.35 21T-24T 3.85 24T-27T 4.35 27T-30T 4.80 30T-33T 5.25 33T-36T 5.75
Bus	Same as truck		Interurban \$1.00 Other 1.75	\$.45		\$1.50	\$1.00	\$.75
Passenger in bus	Adult \$.25 Child .15						\$.10	\$.10
Types of traffic for which reduced rate tickets are available	none	Passenger cars and trucks	Passenger cars; discount for trucks and buses varying with monthly usage	Passenger cars and trucks	none	none	Passenger cars and passengers; discount for trucks and buses varying with monthly usage	Passenger cars and passengers

*This bridge is now free; toll schedule shown is for proposed application when toll plan becomes effective.
 **Combination rates are available for trips over Tacoma Narrows and Fox Island bridges.
 RT - Round trip.

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Toll Schedule For The Bridge

In establishing a toll schedule for a new bridge which replaces a ferry, it is customary to give primary consideration to the toll schedule in use on the ferry, tolls in use at other bridges in the general area and the need for modernization of the existing toll schedule. The table opposite sets forth the toll schedules of the Astoria-Megler Ferry and other toll facilities on the Columbia River and in the Puget Sound area. The passenger car toll is highest on the Astoria-Megler Ferry, truck tolls on the Ferry are higher than most other facilities and most of the bridges do not charge for extra passengers, as does the Ferry.

Whereas the toll rates on the Astoria-Megler Ferry are generally higher than tolls on other facilities in the area, it is appropriate to mention two other "high-toll" facilities that were financed with revenue bond issues: the Mackinac Bridge in northern Michigan and the Sunshine Skyway which crosses Lower Tampa Bay in Florida. At the Mackinac Bridge, the passenger car toll is \$3.25 and the larger trucks pay approximately \$12.00. At the Sunshine Skyway, the passenger car toll has been \$1.75.

For the proposed new Bridge at Astoria, we have developed a toll schedule which is at the same general level as the Ferry toll schedule, but eliminates the charge for extra passengers and classifies trucks by gross weight as is the practice on the Longview Bridge. This proposed toll schedule and application of these tolls to the past twelve months' traffic volume at the Ferry is shown on the next page.

Proposed Bridge Tolls, Pro Forma Revenue

Vehicle Classification	Toll	Traffic 4/57-3/58	Revenue
<u>Passenger cars, pickup and panel trucks</u>	\$1.75	114,456	\$200,298
<u>Passenger cars with:</u>			
Trailers, 1 axle	2.00	3,322	6,644
Trailers, 2 or more axles	3.00	175	525
<u>Motorcycles</u>	1.75	439	768
<u>Motorcycles with sidecars</u>	1.75	10	17
<u>Trucks</u>			
Gross lic. wt. - 4,000 to 6,000 lbs.	2.25	532	1,197
6,001 to 12,000 lbs.	2.50	279	697
12,001 to 18,000 lbs.	2.75	1,131	3,110
18,001 to 24,000 lbs.	3.00	3,088	9,264
24,001 to 30,000 lbs.	3.25	1,336	4,342
30,001 to 36,000 lbs.	3.50	41	143
36,001 to 42,000 lbs.	3.75	34	127
42,001 to 48,000 lbs.	4.00	75	300
48,001 to 54,000 lbs.	4.25	75	318
54,001 to 60,000 lbs.	4.50	75	337
60,001 to 66,000 lbs.	4.75	75	356
66,001 to 72,000 lbs.	5.00	75	375
<u>Buses</u>	3.00		
Total revenue			\$228,822
Totals and Averages			
Passenger cars and passengers	\$1.75	114,456	\$200,298
Trucks and cargo	3.02	6,816	20,569
Others	2.02	3,946	7,954
All vehicles	\$1.83	125,218	\$228,822

A comparison of the total revenue figure shown above, \$228,822, with the actual revenue of \$223,926 as shown in the table on page 9, indicates that the proposed toll schedule will produce slightly more money than is now being produced by the existing Ferry toll schedule.

TIME SAVINGS FOR THE PROPOSED BRIDGE

As previously discussed, the proposed Bridge will offer motorists now using the Ferry a time saving of more than 30 minutes. Using the proposed toll schedule described in the previous section, which is at the same level as the present toll schedule, motorists now using the Ferry will get this time saving at no extra cost. (The Oregon State Highway Department intends to discontinue the Ferry operation when the new Bridge is completed.)

Experience at other new bridges which have replaced a ferry indicate that the shorter crossing time of the new bridge often attracts motorists that have been using other routings. The motorist on other routes apparently gives consideration to time savings, distance savings, more pleasant driving conditions and toll cost in making his decision to change to the new Bridge.

We drove 2,000 miles over the highways of the area to record data on times and distances for principal trips which might be made, at a time saving, via the proposed new Bridge. We compared data obtained from this work with corresponding data collected in 1954, and found a clear record of much shorter trip times in 1958 than in 1954, primarily on:

- (a) Highway US 830 in Washington between Kelso and Ilwaco
- (b) Highway US 30 in Oregon between Ranier and Astoria
- (c) Highway US 99 in Washington between Olympia and Kelso

Unfortunately for the proposed Bridge, these shorter trip times resulting from highway improvements have materially reduced the advantages the new Bridge can offer.

Future Highway Improvements

The principal highway improvements now programmed that may be expected to influence traffic for the proposed Bridge are as shown on the following page.

- (a) Completion of new highway 12B between Megler, Knappton and Naselle, Washington.
- (b) Construction of the by-pass of US 101 around Seaside, Oregon.
- (c) Completion of improvements to US 99 through Washington and Oregon, to bring this highway up to Interstate standards with dual roadways and limited access.

Principal Trips

Using the times and distances data we obtained on the highways of the area, adjusted to reflect highway improvements and the proposed Bridge, plus data on tolls, we have made comparisons of various routes for principal trips which might be diverted to the proposed Bridge at Astoria. The two most important comparisons are:

Route	Annual Traffic (1958)	Passenger Car Toll	Time (Hrs/Min.)	Distance (Miles)
Trips Between Portland, Oregon and Long Beach, Washington				
US 26, US 101, Ferry, US 101	9,500	\$1.75	3:30	123
Interstate Bridge, US 99, US 830, US 101	73,000	Free/20¢	3:04	134
US 26, US 101, Proposed Bridge, US 101		\$1.75	2:47	127
Trips Between Astoria, Oregon and Olympia, Tacoma, Seattle, Washington				
Ferry, US 101, Rt. 9, US 410	17,500	\$1.75	3:30	124
US 30, Longview Bridge, US 99	43,000	.50	2:48	127
Proposed Bridge, Rt. 12B, US 830, US 101, Rt. 9, US 410		1.75	2:37	120

The above-listed comparisons show the savings which will be available by using the proposed Bridge, and the toll cost to obtain these savings will be:

	Time Savings (Min.)	Toll Cost Difference
Portland - Long Beach via proposed Bridge	17	\$1.55
Astoria - Olympia via proposed Bridge	11	1.25

Seaside vs. Long Beach

Data obtained from this study were used to compare the volumes of traffic and trip times and distances for travel between Portland and the two resort areas of Seaside, Oregon and Long Beach (and the peninsula), Washington as follows:

Trip	Annual Traffic (1958)	Trip Time (Hrs/Min.)	Dis - tance (Miles)	Toll Cost
Portland-Seaside, via US 26	192,000	1:50	80	-
Portland-Long Beach, via Ferry	9,500	3:30	123	\$1.75
Portland-Long Beach, via US 99, US 830	73,000	3:04	134	-
Subtotal, Portland-Long Beach	82,500			

These traffic volumes to each resort appear to correlate, roughly, with the travel times to each. We had hoped to find "below normal" traffic between Portland and Long Beach which might be stimulated by the proposed Bridge, but such is not the case.

TRAFFIC DIVERSION

In accordance with the preceding discussion of time savings and toll costs, the principal source of divertable traffic for the proposed Bridge is the Astoria-Megler Ferry which will carry approximately 125,000 vehicles in the year 1958. We expect all of these vehicles to use the proposed Bridge, happily.

The other two principal locations where potential traffic for the proposed new Bridge may be measured, are the Longview Bridge and the survey station on US 830 west of Stella, Washington. For data on Longview Bridge traffic we used origin and destination information obtained in the 1954 survey, expanding it to 1958 volumes by means of detailed traffic records maintained at the Bridge.

We examined the various traffic movements using the Longview Bridge and highway US 830, making time, distance and toll cost comparisons for the trips via various routings. We then estimated traffic diversions that may be expected to

take place if the proposed Bridge is constructed. We made the same study of traffic movements, passing the survey station on US 26 in Oregon. There, as expected, we found only minor traffic movements that are potential to the proposed Bridge. In all of this work we were careful to exclude duplicates so that, for example, trips which passed through both the survey station on US 26 in Oregon and the survey station at the Ferry were assigned to one station only, the Ferry in this example.

The results of this diversion study are shown on the table on the following page.

PROPOSED COLUMBIA RIVER BRIDGE AT ASTORIASources of Traffic Diverted From Other Bridges
(1958 Level)

	Total Annual Traffic	Per Cent Diverted	Annual Traffic Diverted
<u>Survey Station No. 1, The Ferry</u>	125,000	100%	125,000
<u>Survey Station No. 2, on US 830 near Stella, Wash.</u>			
12 Long Beach 13 Portland Passenger cars	65,597	10	6,560
Trucks, 2A 4T	4,556	10	456
2A 6T	504	10	50
3A	932	0	
5A	1,438	0	
	73,027		7,066
3 Svenson 12 Long Beach Passenger cars	1,532	90	1,379
Trucks, 2A 4T	236	90	212
	1,768		1,591
8 Cathlamet 9 Tillamook Passenger cars	724	70	507
Trucks, 2A 4T	236	70	165
	960		672
All other potential movements	11,358	20.9	2,377
Non-potential movements	497,887	0	
Total	585,000		11,706
<u>Longview Bridge</u>			
1 Astoria- 20 Seattle Passenger cars	42,169	20	8,434
Seaside Trucks	850	5	43
	43,019		8,477
1 Astoria- 32 British Passenger cars	2,338	20	468
Seaside Columbia	2,338		468
1 Astoria- 18 Bremerton Passenger cars	2,904	10	290
Seaside	2,904		290
All other movements	564,739	0	
Total	613,000		9,235
<u>Survey Station No. 3 on US 26</u>			
1 Seaside 8 Cathlamet Passenger cars	2,016	50	1,008
Trucks, 2A 4T	1,041	50	521
2A 6T	901	0	
	3,958		1,529
1 Seaside 20 Seattle Passenger cars	2,940	50	1,470
	2,940		1,470
20 Seattle 25 Astoria Passenger cars	1,628	25	407
	1,628		407
All other potential movements	1,660	43.7	725
Non-potential movements	714,814	0	
Total	725,000		4,131
Grand Total	2,048,000		150,000

INDUCED TRAFFIC

When a new bridge is opened, replacing a ferry, it usually shows a greater volume of traffic on the new bridge than the total of the existing ferry plus known diversions from other routes. This increase is in addition to that caused by the normal year-to-year growth which has been a characteristic of the facility. The segment of traffic constituting the unusual increase is called induced traffic. Induced traffic may result from the increase in traffic capacity which the new facility provides or from the increase in convenience if the new facility provides a more direct or better route than existed before.

The following table shows examples of induced traffic experience where bridges replaced ferries:

Bridge	Year Opened	Induced Traffic As Per Cent of Diverted Traffic
Benjamin Franklin Bridge (Pennsylvania-New Jersey)	1926	119% (1st year)
Tacony-Palmyra Bridge (Pennsylvania-New Jersey)	1930	55 (1st year)
San Francisco-Oakland Bay Bridge (California)	1937	70 (1st year)
Mackinac Bridge (Michigan)	1957	50 (1st year)

In developing our estimate of induced traffic for the proposed new Bridge at Astoria, we must take into account the following factors:

1. The amount of improvement to be offered by the new Bridge is high, savings of more than 1/2 hour over the Ferry, plus increased convenience.
2. There is no shortage of ferry capacity in this instance, except possibly for a rare occasion on a day or two a year.
3. The lack of a nearby large center of population. Portland is the nearest large population center and it is nearly 100 miles away.
4. The length of river front which is available exclusively for the proposed new Bridge is approximately 30 miles to the present Puget Island ferry or 55 miles to the present Long-view Bridge.

From the preceding considerations we estimate that induced traffic for the proposed new Bridge will be as follows:

First year	- 25 per cent of the diverted traffic
Second year	- 10 per cent of the diverted traffic
Total	35 per cent

TRAFFIC GROWTH

The proposed Bridge could not be ready for use until 1964, so that we must estimate growth which may take place in the potential traffic between now, 1958, and 1964. The traffic growth history for the Astoria-Megler Ferry is pertinent, and is shown in the table which follows:

Astoria-Megler Ferry

Year	No. of Vehicles (AADT)	Per Cent Change
1947	341	
1948	334	-2.1%
1949	329	-1.5
1950	334	+1.5
1951	381	+14.1
1952	410	+7.6
1953	389	-5.1
1954	365	-6.2
1955	381	+4.4
1956	368	-3.4
1957	342	-7.1
Average Annual Rate of Growth 1947-1957 0		

The above record is in contrast to the average of 8.0 per cent annual growth recorded at the Longview Bridge and the smaller average growth of 1.5 per cent for the Interstate Bridge, as shown in the table on the following page.

Traffic Growth History

Year	Longview Bridge		Interstate Bridge	
	No. of Vehicles (AADT)	Per Cent Change	No. of Vehicles (AADT)	Per Cent Change
1947	717		29,103	
1948	1,007	+40.4%	31,887	+9.6%
1949	806	-20.0	29,126	-8.7
1950	779	-3.3	31,623	+8.6
1951	891	+14.4	32,228	+1.9
1952	1,039	+16.6	34,500	+7.0
1953	1,181	+13.7	30,434	-11.8
1954	1,252	+6.0	29,800	-2.1
1955	1,365	+9.0	32,400	+8.7
1956	1,482	+8.6	34,400	+6.2
1957	1,542	+4.0	33,800	-1.7
Average Annual Rate of Growth 1947-1957		+8.0%		+1.5%

Other pertinent traffic volume growth series come from the permanent traffic recorders operated by the States of Washington and Oregon on the principal "east-west" highways of the area. The table below shows these traffic volumes.

Year	Washington US 830 West of Stella	Oregon		Sum of 3 Routes
		US 30 West of Ranier	US 26 at Sunset Tunnel	
	(Annual Average Daily Traffic)			
1951	1,521			
1952	1,401		2,222	
1953	1,359		2,268	
1954	1,444		2,157	
1955	1,800	1,481	2,218	5,981
1956	1,600	1,545	2,228	5,745
1957	1,550	1,613	2,112	5,516
Growth trend	0	up	down	down

The recorders on US 30 and US 26 have not been operated for as many years as that on US 830.

Motor Fuel Consumption

The table on the following page shows the motor fuel consumption in the States of Washington and Oregon for the period 1947 through 1957. The average annual

rate of increase of motor fuel consumption in each State was higher for the period 1947-1957 than for the past five years, 1952-1957.

Year	Washington		Oregon	
	Gallons (000)	Per Cent Increase	Gallons (000)	Per Cent Increase
1947	524,676		383,410	
1948	562,099	7.1%	419,003	9.3%
1949	581,163	3.4	433,525	3.4
1950	618,953	6.5	468,395	8.0
1951	665,733	7.6	500,295	6.8
1952	699,284	5.0	530,014	5.9
1953	730,954	4.5	535,405	1.0
1954	748,776	2.4	541,170	1.1
1955	798,641	6.7	577,364	6.7
1956	833,111	4.3	604,238	4.7
1957	840,907	0.9*	601,398	-0.5
Annual rate of growth:				
1947-1957		4.8%		4.6%
1952-1957		3.8%		2.6%

*In 1957, an exemption for transit vehicles was in effect; if 1957 consumption were stated on the same basis as in effect in prior years, the increase over 1956 would be shown as 1.4 per cent.

Population Data

As suggested by the earlier table of principal traffic movements on the Ferry, the populations of Clatsop County, Oregon and Pacific County, Washington are most important to the proposed new Bridge. The table which follows shows population trends for these two Counties and for the States of Washington and Oregon for the period 1940 to 1956. The populations of the two Counties have not grown as rapidly as the States in which they are located, and have had virtually no growth since 1950.

Population Trends - 1940-1956

	Washington	Pacific County	Oregon	Clatsop County	Astoria
1940 census	1,736,191	15,928	1,089,684	24,697	10,389
1950 census	2,378,963	16,558	1,521,341	30,776	12,331
Estimate of 1/1/56*	2,602,000	16,700	1,684,000	30,700	N.A.
Annual rate of growth 1940-1956	2.6%	0.3%	2.8%	1.4%	1940-1950 1.7%
Annual rate of growth 1950-1956	1.5%	0.1%	1.7%	0	N.A.

*From Rand McNally Commercial Atlas and Marketing Guide, 1958

N.A. - Not available

We note that both Clatsop and Pacific Counties, which would be served directly by the proposed new Bridge, have relatively small total populations. The Portland-Vancouver area is the nearest large population center with approximately 670,000 people, but it is 100 miles away. The Seattle-Tacoma area is another large population center, of approximately 750,000 people, but it is approximately 200 miles away.

Future Traffic Growth

Reasonable estimates of future traffic growth must reflect recent history. In this instance there has been virtually "no growth" in the Ferry traffic and County populations which are the principal potential toll payers for the proposed new Bridge. Although this record does not support optimism, we have selected a figure of 2 per cent per year as a reasonable expectation of the normal growth of traffic which might use the proposed new Bridge.

ESTIMATED FIRST-YEAR TRAFFIC AND REVENUE

As stated in previous sections of this Report, the principal source of first-year traffic and revenue for the proposed Bridge is that which is now using

the Astoria-Megler Ferry. The 1958 performance of the Ferry is estimated to be as follows:

Ferry traffic	125,000 vehicles
Average toll, at the schedule for the proposed Bridge	\$1.83
Revenue, pro forma	\$228,822

If the proposed Bridge is constructed across the Columbia River at Astoria, it is expected that a regular bus service will be started with a frequency of four bus trips per day. This bus traffic would produce revenue on a 1958 basis, as follows:

Bus traffic	1,460 vehicles
Average toll	\$3.00
Revenue	\$4,380

Using the above, plus our previously described estimates of diversions of traffic from other routes and our estimates of induced and growth traffic, we calculate the 1964 traffic and revenue to be as follows:

	Vehicles	Average Toll	Revenue
Diverted from the Astoria-Megler Ferry	125,218	\$1.83	\$228,822
Added: Buses (4 per day)	1,460	3.00	4,380
Diversion from:			
Survey Station No. 2	11,706	1.88	22,052
Longview Bridge	9,235	1.76	16,226
Survey Station No. 3	4,131	1.78	7,360
Total	151,750	\$1.84	\$278,840
Rounded to	152,000		
Growth of traffic, at 2% per year	19,000		
	171,000		
Induced traffic, first year at 25%	43,000		
Total 1964 Bridge traffic and revenue	214,000	\$1.84	
1964 revenue at a higher average toll reflecting 15% truck traffic (explanation in following paragraph)	214,000	\$1.95	\$417,000

The Ferry today carries 5.4 per cent truck traffic, which may be compared with the 15 per cent truck traffic recorded at the Longview Bridge. This comparison is quite reasonable, for the Ferry has certain physical limitations which will not permit it to carry the largest trucks and there is the inconvenience of matching truck departure times with Ferry schedules. We estimate that the proposed new Bridge would carry a higher percentage of trucks than the present Ferry. To reflect this, we have increased the average toll per vehicle for traffic estimated to be using the Bridge from \$1.84 to \$1.95. This higher average toll is calculated on the basis of 85 per cent passenger cars at \$1.75 and 15 per cent trucks at \$3.00.

OPERATING AND MAINTENANCE EXPENSES

We have studied records of operating and maintenance expenses for the Longview Bridge and other bridges located in various parts of the country. We consulted with the Washington Toll Bridge Authority and the Oregon State Highway Department for additional information on expenses for the proposed Bridge at Astoria. We then developed the following general estimates of Bridge expense for the first year of operation, 1964.

	Annual Expenses
<u>Operation</u>	
One manager	\$ 5,000
Seven collectors and tellers at \$3,500	24,500
Light and power	7,500
Insurance	50,000
Miscellaneous	2,500
Subtotal	\$ 89,500
<u>Maintenance</u>	
Routine maintenance	\$ 50,000
Reserve for painting	50,000
Unusual expenses: 0.05% of replacement cost up to reserve of 0.2%	12,500
Subtotal	\$112,500
Total	\$202,000

Records of bridge expenses in Washington and other parts of the country generally show a steady increase each year during the past ten years. Accordingly, for the projections of Bridge expense which follow, we estimate that the expense will increase \$3,000 each year.

PROJECTIONS OF TRAFFIC, REVENUE,
EXPENSE AND NET REVENUE

From the study described herein, we have developed the following projections of traffic, toll revenue, operating and maintenance expenses and net revenue which may reasonably be expected for the proposed Bridge at Astoria for each year of the period, 1964 through 1993. The table which follows summarizes these estimates.

Year	Per Cent Increase	Vehicles	Gross Revenue at \$1.95 Per Vehicle	Operating and Maintenance Expenses	Net Revenue
	(T h o u s a n d s)				
1964	2% + 10% Induced 2%	214	\$ 417	\$ 202	\$ 215
1965		235	458	205	253
1966		240	468	208	260
1967		245	478	211	267
1968		250	488	214	274
1969		255	497	217	280
1970		260	507	220	287
1971		265	517	223	294
1972		270	527	226	301
1973		275	536	229	307
10-year total, 1964-1973			\$ 4,893	\$2,155	\$2,738
20-year total, 1974-1993			\$10,720	\$4,580	\$6,140
30-year total			\$15,613	\$6,735	\$8,878

FINANCIAL FEASIBILITY

A comparison of the above-listed estimates of net revenue which could be available for debt service, and the previously mentioned figure of \$1,400,000 annual interest, or a \$1,820,000 figure for interest and amortization at a 5 per cent interest rate for the bond issue of \$28,000,000 required to finance project, shows clearly that the project is not financially feasible on a normal basis.

Our study has confirmed what is already well-known to others who have considered this project; that Clatsop and Pacific Counties stand to benefit greatly by the construction of this proposed Bridge. Unfortunately, as shown by the net revenues listed on the preceding page, the "revenue potential - project cost" relationship will not support conventional revenue bond financing. Accordingly, those responsible for Bridge planning may wish to consider the following:

1. Payment of all maintenance and operating expenses for the Bridge from regular Highway Department funds. We note that the present Ferry operation costs the Oregon State Highway Department a net of \$90,000 per year.
2. The assignment of Federal Aid to this proposed Bridge by both of the States involved, for a several-year period. This could reduce the size of the bond issue required to finance the project.
3. Proceed with the design of the Bridge and request bids for the construction before selling a bond issue. This would determine the exact amount of money which will be required for the project, would reduce the contingency item and may reduce the bond issue amount.
4. Combine the financial operation of the Longview Bridge and the Interstate Bridge with that of the proposed Bridge at Astoria, pledging the earnings of all three bridges to support the bond issue needed to finance the proposed Astoria Bridge. (The policies of the Federal Bureau of Public Roads respecting toll bridges, as related to the Interstate Bridge, may affect the development of such a plan.)
5. Obtain legislation pledging State faith and credit for the debt service on bonds which might be issued as described in No. 4 above. Provision could be made for future pay-back to the States of any State money used for debt service on the bonds.

It should be recognized that whereas application of some or all of the above-listed suggestions might produce a salable bond issue and, in turn, the money needed for construction of the proposed Bridge at Astoria, the revenues produced by the Bridge during its first 20 years of operation are not expected to be sufficient to cover debt service. The difference between Bridge revenues and debt service

will probably be at least \$1,000,000 per year. If, after the debt is largely paid off and development of the area has resulted in substantially larger traffic volumes, the Bridge might become financially self-supporting during the later years of the life of the bond issue.

COMPARISON WITH 1955 ESTIMATES

As previously mentioned, we made a study in 1954 of a proposal for a bridge at Astoria, and in March 1955 submitted a report which included much higher estimates of traffic and net revenues available for debt service. The principal reasons for the difference between the 1955 estimates and those presented in this Report are:

1. Highways that are competing routes have been greatly improved since 1954, notably US 830 west of Longview, US 30 west of Ranier and US 99 between Kelso and Olympia. This materially reduces estimated diversions to the proposed Bridge of traffic from other routes.
 2. The lack of growth in recent years of Ferry traffic and Clatsop and Pacific Counties' populations does not support as high a future growth rate as that selected for the 1955 report. Also, there has been a decrease in Ferry traffic since 1954 so that the basis for projections is now lower than it was for our 1955 estimates.
 3. The record of induced traffic at new toll facilities that have opened since 1954 does not support as high an induced estimate for the proposed Astoria Bridge as that used in our 1955 report.
 4. Our estimates of operating and maintenance expenses contained in this Report are based on recent expense experience and consultation with the Highway Departments of both States, and are higher than the expense estimates included in our 1955 report. The 1955 estimates were not made by us, but were furnished to us by others.
-

We wish to acknowledge the co-operation and assistance we received from many representatives of the Washington Toll Bridge Authority, the Washington State Highway Commission and the Oregon State Highway Department during the course of this study.

Respectfully submitted,

Coverdale & Colpitts
Consulting Engineers

EXHIBITS

PROPOSED COLUMBIA RIVER BRIDGE AT ASTORIAMINIMUM FERRY SCHEDULE FOR EACH MONTH OF THE YEAR

January-April October-December		May, First Part of June, Last Part of September		Last Part of June, First Part of September		July and August	
Leave Astoria	Leave Megler	Leave Astoria	Leave Megler	Leave Astoria	Leave Megler	Leave Astoria	Leave Megler
AM	AM	AM	AM	AM	AM	AM	AM
6:30	7:15	6:30	7:15	6:30	7:15	6:30	7:15
8:00	8:45	8:00	8:45	8:00	8:45	8:00	8:45
9:30	10:15	9:30	10:15	9:30	10:15	9:30	10:15
.....				10:00	10:45	10:00	10:45
.....						10:30	11:15
11:00	11:45	11:00	11:45	11:00	11:45	11:00	11:45
.....					PM		PM
.....				11:30	12:15	11:30	12:15
.....						12:00	12:45
PM	PM	PM	PM	PM	PM	PM	PM
12:30	1:15	12:30	1:15	12:30	1:15	12:30	1:15
.....				1:00	1:45	1:00	1:45
.....						1:30	2:15
2:00	2:45	2:00	2:45	2:00	2:45	2:00	2:45
.....				2:30	3:15	2:30	3:15
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3:30	4:15	3:30	4:15	3:30	4:15	3:30	4:15
.....				4:00	4:45	4:00	4:45
.....						4:30	5:15
5:00	5:45	5:00	5:45	5:00	5:45	5:00	5:45
6:30	7:15	6:30	7:15	6:30	7:15	6:30	7:15
8:00	8:45	8:00	8:45	8:00	8:45	8:00	8:45
.....		9:30	10:15	9:30	10:15	9:30	10:15

July 15, 1958

ASTORIA-MEGLER - TRAFFIC SURVEYInstructions to InterviewersSAMPLE INTERVIEW CARDS

DO NOT BEND CARDS

0. STATION	DAY	HOUR	DIRECTION																		
2	27	6	N																		
1. VEHICLE CLASS																					
☒ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12																					
2. ORIGIN																					
PORTLAND																					
3. DESTINATION																					
LONG BEACH																					
4.																					
ROUTE US 26/101																					
5.																					
5																					
6. INTERVIEWER																					
12																					
1.	0	1	2	3	4	5	6	7	8	9	1.	0	1	2	3	4	5	6	7	8	9
2.	0	1	2	3	4	5	6	7	8	9	2.	0	1	2	3	4	5	6	7	8	9
3.	0	1	2	3	4	5	6	7	8	9	3.	0	1	2	3	4	5	6	7	8	9
4.	0	1	2	3	4	5	6	7	8	9	4.	0	1	2	3	4	5	6	7	8	9
5.	0	1	2	3	4	5	6	7	8	9	5.	0	1	2	3	4	5	6	7	8	9
6.	0	1	2	3	4	5	6	7	8	9	6.	0	1	2	3	4	5	6	7	8	9

COVERDALE & COLPITTS

0. STATION	DAY	HOUR	DIRECTION																		
2	28	14	S																		
1. VEHICLE CLASS																					
☒ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12																					
2. ORIGIN																					
OLYMPIA																					
3. DESTINATION																					
SAN FRANCISCO																					
4.																					
US 410, 101																					
5.																					
00																					
6. INTERVIEWER																					
23																					
1.	0	1	2	3	4	5	6	7	8	9	1.	0	1	2	3	4	5	6	7	8	9
2.	0	1	2	3	4	5	6	7	8	9	2.	0	1	2	3	4	5	6	7	8	9
3.	0	1	2	3	4	5	6	7	8	9	3.	0	1	2	3	4	5	6	7	8	9
4.	0	1	2	3	4	5	6	7	8	9	4.	0	1	2	3	4	5	6	7	8	9
5.	0	1	2	3	4	5	6	7	8	9	5.	0	1	2	3	4	5	6	7	8	9
6.	0	1	2	3	4	5	6	7	8	9	6.	0	1	2	3	4	5	6	7	8	9

COVERDALE & COLPITTS

WRITE OR PRINT PLAINLY
Do Not Bend, Tear or Fold Cards